

. · (1)

TWR- 17541 Vol. VII ECS #: SS 01010

Flight Set 360L002 (STS-27) Field Joint Protection System Final Report Volume 7

June 1989

Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION **GEORGE C. MARSHALL SPACE FLIGHT CENTER** MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

Contract No.

NAS8-30490

DR. No.

3-5

WBS No.

4B601

MORTON THIOKOL, INC.

Space Division

P.O. Box 524, Brigham City, Utah 84302 (801) 863-3511

FLIGHT SET 360L002 (NASA-CR-183745-Vol-7) (STS-27) FIELD JOINT PROTECTION SYSTEM, VOLUME 7 Final Report (Morton Thiokol) CSCL 21H 39 p

N89-29480

Unclas

G3/20 0231730

FORM TC 4677 (REV 8-86)

Space Operations

TWR-17541 VOL. VII FLIGHT SET 360L002 (STS-27) FIELD JOINT PROTECTION SYSTEM FINAL REPORT VOLUME 7 FINAL REPORT

PREPARED BY:

ELGIE HALE COMPONENT DESIGN

APPROVED BY:

SUPERVISOR COMPONENT DESIGN SECTION

SEILER

PROJECT ENGINEERING

TED OLSEN

CERTIFICATION PLANNING

PROGRAM MANAGER

COMPONENTS

SAFETY

STEVE WEST

RELIABILITY

DOC TWR-17541 NO.

VOL VII

SEC

PAGE

REVISION _

Aerospace Group

Space Operations

ACRONYMS

JPS

Joint Protection System

RSRM

Redesigned Solid Rocket Motor

RTD

Resistance Temperature Device

DOC NO. TWR-17541 | VOL VII
SEC | PAGE | 11

Aerospace Group

Space Operations

ABSTRACT

This report contains the pre-launch functioning data of the Field Joint Protection System (JPS) used on STS-27. Also included is the post flight condition of the JPS components following the launch and recovery of the two RSRM boosters. The JPS components are:

- 1. Field Joint Heaters
- 2. Field Joint Sensors
- 3. Field Joint Moisture Seal
- 4. Moisture Seal Kevlar Retaining Straps
- 5. Field Joint External Insulation
- 6. Vent valve
- 7. Power Cables
- 8. Igniter Heater

DOC NO. TWR-17541 VOL VII
SEC PAGE

REVISION _____

Aerospace Group

Space Operations

1.0 INTRODUCTION

Space Transportation System (STS)-27 was launched from KSC pad 39B on 2 December 1988. Two of the Redesigned Solid Rocket Motors (RSRM) were part of the launch system and are designated by RSRM-2A and RSRM-2B. The three field joints of both motors (total of 6 field joints) were protected by the Joint Protection Systems (JPS). See Figure The igniter heater was mounted on the ignitor flange. The heaters were turned on at L-24 hours to See figure 2. assure the joint o-ring and igniter seal temperatures were within the launch commit temperatures at the time of RSRM The purpose of the moisture seal is to prevent entry of rain into the joint while on the pad. insulation provides thermal protection for the JPS during flight.

Following booster separation and splashdown, the motors were recovered and taken to hanger AF for inspection and disassembly. This inspection was performed per Post Flight Engineering and Evaluation Plan (PEEP) TWR-16475, Vol. VII which outlines the basic evaluations to be performed at KSC Hanger AF.

2.0 **OBJECTIVES**

The objective of this report is to document the performance of the JPS and igniter heaters on the pad and the post flight condition of the JPS components. This document will also discuss all observations which were written up as Squawks and/or Problem Reports (PR's).

The following objectives of TWR-18891 are addressed in this report: (Numbers in parenthesis identify CEI specification paragraphs).

REVISION	DOC NO.	TWR-17541	_	VOL.	VII
	SEC		PAGE		
FORM TC 7994-310 (REV 2-88)				1	

Space Operations

- J. Certify the performance of the field joint heater and sensor assembly so it maintains the case field joint at 75° F minimum. Field joints shall not exceed 120° F (3.2.1.11.a).
- K. Certify the performance of the igniter heater so it maintains the igniter gasket rubber seals between 75° and 120° F during and after the motor has been exposed to the ground thermal environments (3.2.1.5.3).
- Certify that each field joint heater assembly meets all performance requirements (3.2.1.11.1.2)

3.0 CONCLUSIONS AND RECOMMENDATIONS

The JPS heaters performed per specification and maintained the field joint temperatures within the required temperature range at the time of motor ignition (3.2.1.11.a).

The igniter heater performed per specification and maintained the igniter seals within the required temperature range (3.2.1.5.3).

All field joint heater assemblies met all of the performance requirements (3.2.1.11.1.2).

The component design team identified two conditions in which the JPS components failed to meet the design goals.

NO. TWR-17541 VOL VII

Space Operations

- 1. The moisture seals of five of the six field joints were found to contain sea water. Three of the twelve vent valves in the moisture seals were open to air flow in both directions. The vent valves may have provided the path for sea water to enter the joints on splash down.
- 2. A 3.0 x 3.0 inch void was found in the cork insulation of the right center field joint. This had apparently occured on splash down.
- 3. The igniter heaters were charred in two places where instrumentation wiring was improperly run between the heater and igniter adapter.

4.0 RESULTS/DISCUSSIONS

4.1 Heater Control System

The KSC heater temperature control system operated with a control band of $2^{\circ}F$ (set point temperature +/- 1°). The four temperature sensors at each field joint were continuously monitored and the coldest sensor was automatically selected for temperature control. The switching logic was improved over the flight one logic and switching to a different sensor for control did not turn on the heater unless the sensor temperature was more than 1° below the set temperature.

	_	
MARTA	THIOKOL	IN IC
IVIC HOLD IN	, , , , , , , , , , , , , , , , , , , ,	INI

Space Operations

4.2 Post Flight Inspection of the Joint Protection System

Evaluations of the JPS indicated the system performed as designed during flight. The only unexpected observation was the piece of missing cork on the right center field joint.

4.2.1 Moisture Seal

The water discovered in the field joints is believed to have entered by way of one or all of the one-way vent valves located at each joint. Some of the valves were found to be impaired when they were removed from the joint protection system.

A test of the vent valves on STS-27 was conducted in the VAB after assembly which verified that all vent valves were closed. This confirms that the vent valves were closed and prevented entry of rain water into the field joint while on the pad.

Tables 1 though 6 are the evaluation check off worksheets for the moisture seals and cork thermal shields.

4.2.2 Cork External Insulation

All of the cork and ablative compound on the field joints was intact and appeared well bonded except the 3 inch by 3 inch piece on the right center joint. Occasional pitting of the cork and paint was observed on those aft

Aerospace Group

Space Operations

surfaces of cork that were exposed to nozzle severance and splashdown debris. Areas of darkened paint accompanied with blisters were also observed.

A piece of cork (3 x 3 inches) was missing on the right hand center field joint due to the cork not being bonded to the moisture seal. The total void of this region was measured to be 15 inches in length. Due to the heated condition of the cork surrounding the hole, the piece was probably lost during late re-entry. Figure 3 is a photograph of this void.

Tables 7 through 12 are the post test evaluation check off worksheets for the cork external insulation on the six field joints.

4.2.3 Heaters and Sensors

The heater and sensor assemblies were not available for inspection except as shredded pieces after removal by water laser. The pieces looked at showed no signs of overheating, discoloration, or delamination.

Figures 4 through 6 are plots of the temperature of the four RTD's of each of the three field joints of the left SRM and figures 7 though 9 are plot of the RTD's of the right SRM. The ambient temperature is over laid on the temperature plots.

DOC NO.	TWR-17541		VOL	VII
SEC		PAGE	r	
		ı	5	

N 4	_	
MORTON	THIOKOL	INC

Space Operations

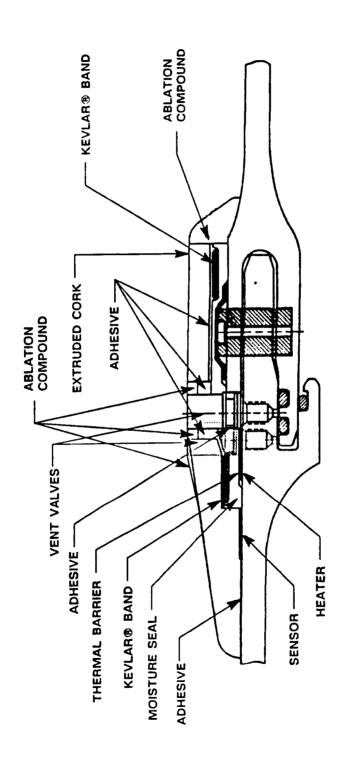
4.2.4 Heater Power and Sensor Cables

All of the cables of the JPS system were found to be in excellent condition. There was no evidence of voids or missing material, debonds, charred material, or impact damage. Tables 13 and 14 are the post test evaluation worksheets for the heater cables.

4.2.5 Igniter Heater

The igniter heater installation on each motor was intact and secure. Both heaters were charred in two places where instrumentation wiring was improperly run between the heater and igniter adapter. The adjacent cork and painted igniter adapter also showed evidence of heat effect. Figures 10 and 11 are the plots of the temperature at the igniter adapter. Tables 15 and 16 are the evaluation checkoff worksheets for the igniter heater installation. Tables 17 and 18 are the evaluation checkoff worksheets for the igniter heater components.

DOC NO. TWR-17541 VOL VII



SPACE SHOP

.08

PRIMARY POWER-Cable

IGNITER HEATER

REDUNDANT POWER. CABLE

-.06

CABLE MOUNTING PAD-

TO FWD SKIRT

ROTATED CCW 32* SECTION A-A

-T-BOLT LATCH BAND CLAMP

-HEATER -CORK

MORTON THIOKOL, INC.

Space Operations

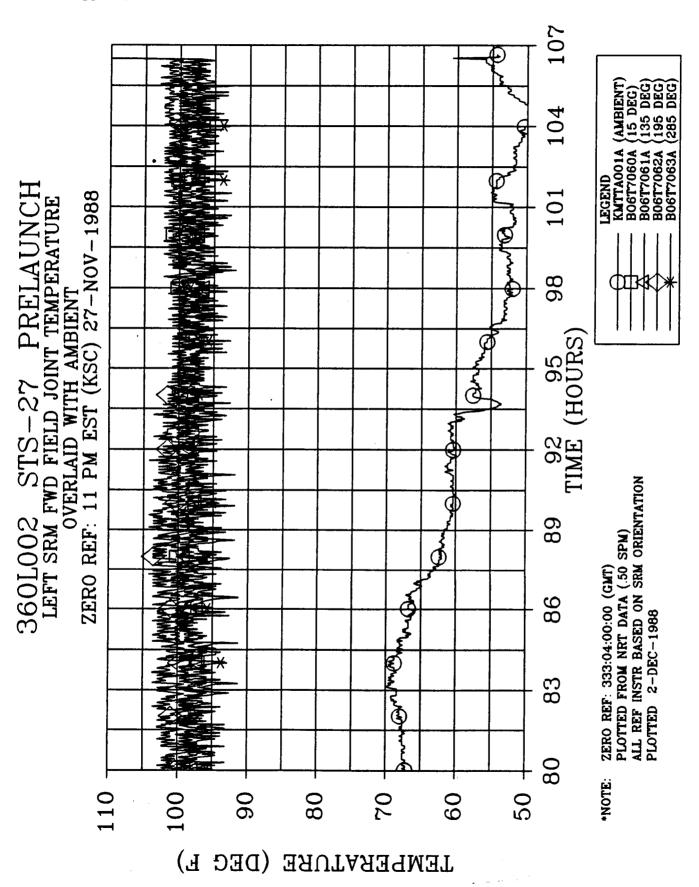
FIGURE 2

INFORMATION ON THIS PAGE WAS PREPARED TO SUPPORT AN ORAL PRESENTATION AND CANNOT BE CONSIDERED COMPLETE WITHOUT THE ORAL DISCUSSION

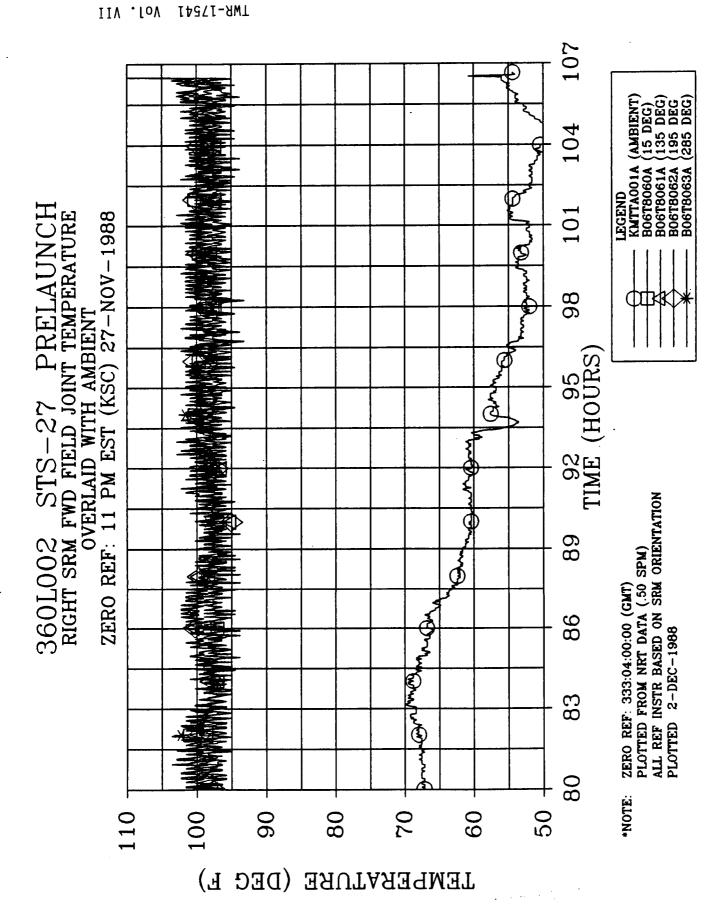
ORIGINAL PAGE BLACK AND WHITE PHOTOGRAPH



igure 3

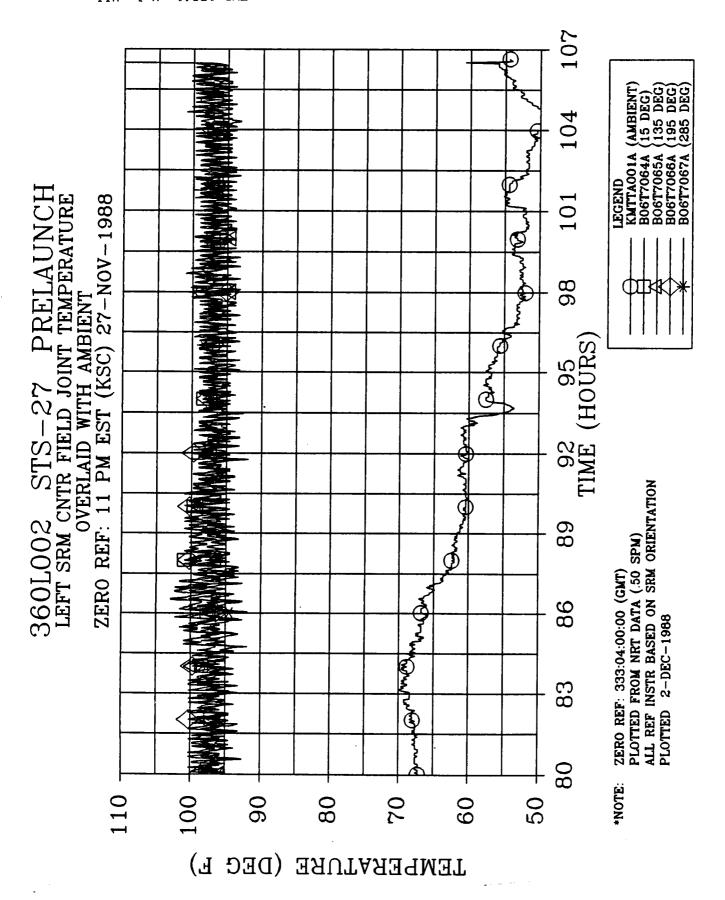


TWR-17541 Vol. VII Page 10

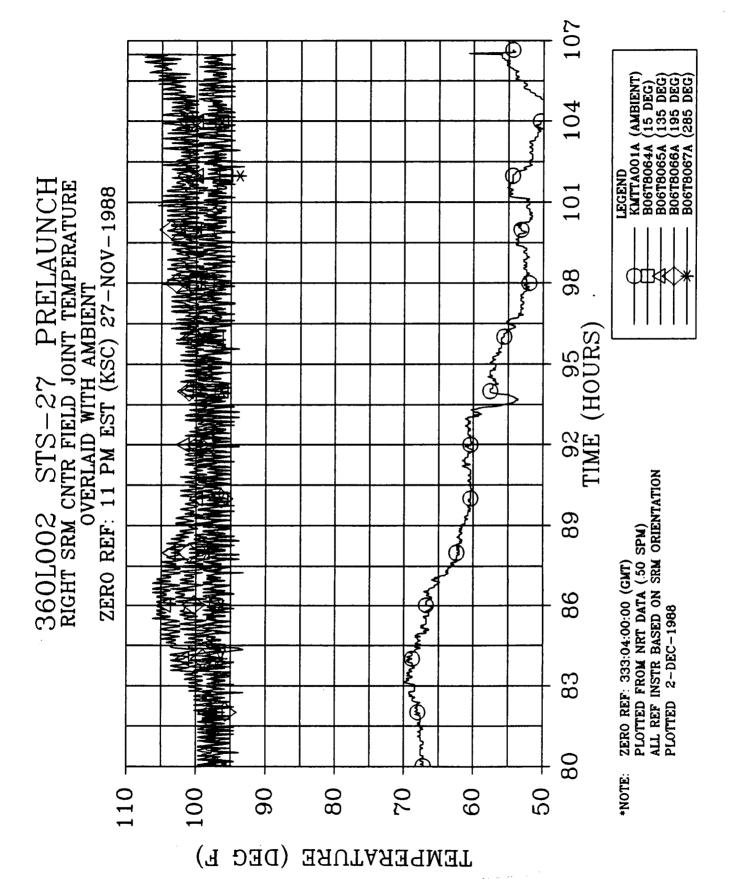


Раде

11

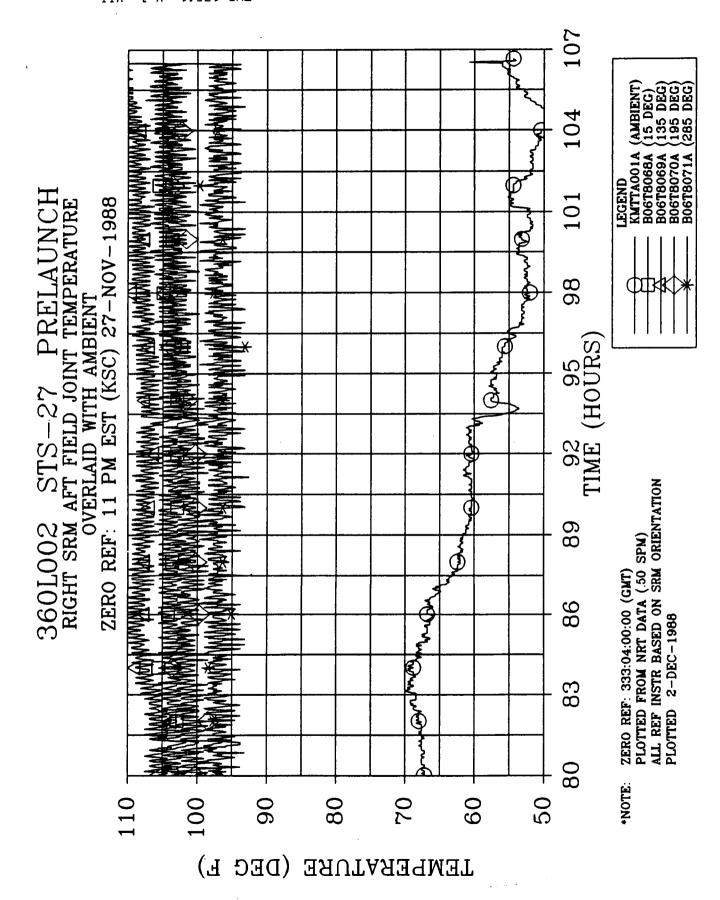


TWR-17541 Vol. VII Page 12



TEMPERATURE

(DEC



TWR-17541 Vol. VII Page 15

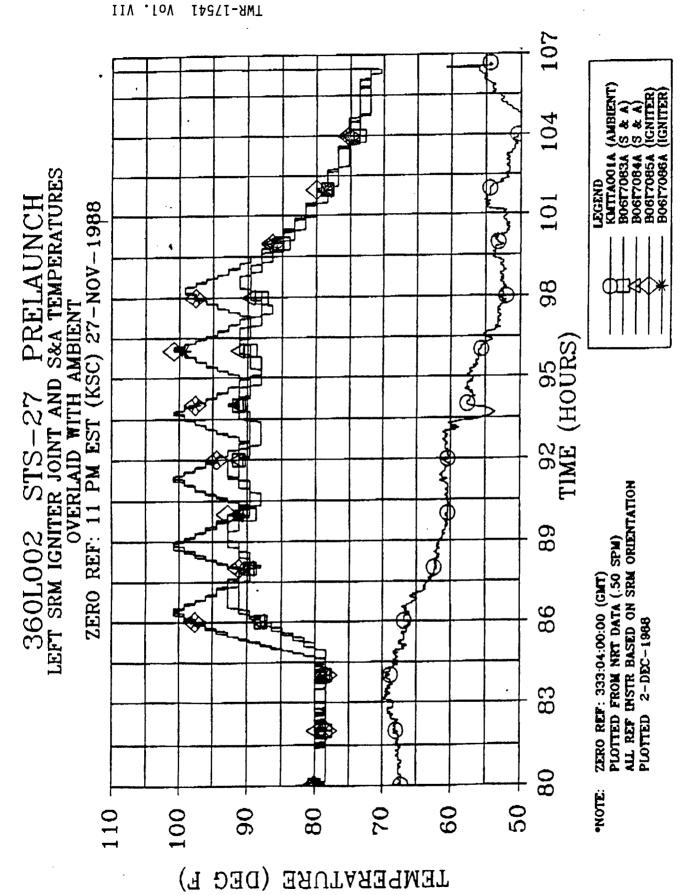


Figure 10

Ьяде

TWR-17541

IIV . foV

11

110

100

90

(DEC

80

70

TEMPERATURE

Figure 11

107

80

50

9

•NOTE:

Field Joint Vent Valve ar	id Moisture Seal - Ev	aluation Checkoff Wor	ksneet (Optional)
Inspector(s): CHARLES GREATWOOD/	ROY HYER		
Motor No.: STS-27	Side: 🗴	Left Right	Date: 12/5/88
Field Joint: X Forward (FWD)	Center (CTR)	Aft (AFT)	Case End: Tang
Component: JPS			
I. Vent Valves Open to Back Pressu	re (VVOBP)?		
A. 45° Degrees		yes	X no
B. 135° Degrees		yes	xno
II. Moisture Under Seal (WATER)? (Optional)		X yes	no
(05:10:12:)			
If any of the above conditions exist, r	ote:		
	Condition	Degree	
	(Observation	Location	
	Code)	(Deg.)	
	Water	N/A	
	-		
Notes / Comments Approximately 25 milliliters	of water under mo	isture seal.	
			•
TADLI			

REV	>>> TWR-17541		VOL VII
	SEC	PAGE	18

Field Joint Vent Valve an	id Moisture Seal - EV	aluation Check	on worksneer (Optional)
Inspector(s): CHARLES GREATWOOD/	ROY HYER		
Motor No.: STS-27	Side: X	Left	Right Date: 12/5/88
Field Joint: Forward (FWD)		Aft (AF	Case End: Tang
Component: JPS			
I. Vent Valves Open to Back Pressu	re (VVOBP)?		
A. 45° Degrees		_x_ yes	no
B. 135° Degrees		yes	X no
II. Moisture Under Seal (WATER)?		Xyes	no
(Optional)			
If any of the above conditions exist, r	note:		
	Condition	Degree	
	(Observation	Location	
	Code)	(Deg.)	
	<u>Water</u>	N/A	
Notes / Comments	of water under m	aictuma caal	
Approximately 50 milliliters	or water under in	oisture seat.	
 			

000 20.	TWR-17541		VOL	VI
SEC		PAGEO		

Field Joint Vent Valve and Moisture Seal - Evaluation Checkoff Worksheet (Optional)

Inspector(s): CHARLES GREATWOOD/RO				
Motor No.: STS-27	Side:	X Left	Right	Date: 12/5/88
Field Joint: Forward (FWD)	Center ((CTR)	Aft (AFT)	Case End: Tang
Component: JPS				
I. Vent Valves Open to Back Pressure	(VVOBP)?			
A. <u>45°</u> Degrees			yes	no
B. 130° Degrees		<u> </u>	yes	no
II. Moisture Under Seal (WATER)?		<u> </u>	yes	no
(Optional)				
If any of the above conditions exist, no	te:			
	Condition	Degre	3 e	
(Observation	Locati	ion	
	Code)	(Deg		
-	Water	N/A	<u> </u>	
-				
-				
_				
Notes / Comments				
Approximately 900 milliliters o	if water und	dar maistur	ا دمء ا	
Approximatery 300 militariters of	n water und	der morstur	c scui.	
				,
	 			

000 00.	TWR-17541		VCL	VII
SEC		PAGE 20		

Field Joint Vent Valve and	d Moisture Seal - Ev	aluation Checkoff Workshe	et (Optional)
Inspector(s): CHARLES GREATWOOD/R	OY HYER		
Motor No.: STS-27	Side:	Left 🛛 Right	Date: 12/5/88
Field Joint:	Center (CTR)	Aft (AFT)	Case End: Tang
Component: JPS			
I. Vent Valves Open to Back Pressur	re (VVOBP)?		
A. 45° Degrees		yes <u>X</u>	
B. 130° Degrees		yesX	
II. Moisture Under Seal (WATER)?		X yes	no
(Optional)			
If any of the above conditions exist, no	ote:		
	Condition	Degree	
	(Observation	Location	
	Code)	(Deg.)	
	<u>Water</u>	<u> </u>	
·			
Notes / Comments Approximtely 20 milliliters of	water under moi	sture seal	
rippi oximoety to mittivities of	water under more	scure scur.	
			•
			į

REV.	300 NO.	TWR-17541 VOL VI
	SEC	PAG5) 1

Field Joint Vent Valve and Moisture Seal - Evaluation Checkoff Worksheet (Optional)								
Inspector(s): CHARLES GREATWOOD/	Inspector(s): CHARLES GREATWOOD/ROY HYER							
Motor No.: STS-27	Side:	Left K Right	Date: 12/5/88					
Field Joint: Forward (FWD)	X Center (CTR)	Aft (AFT)	Case End: Tang					
Component: JPS								
I. Vent Valves Open to Back Pressu	re (VVOBP)?							
A. 45° Degrees			X no					
B. 135°Degrees			X no					
II. Moisture Under Seal (WATER)?		X yes	no					
(Optional)								
If any of the above conditions exist, n	ote:							
	Condition	Degree						
	(Observation	Location						
	Code)	(Deg.)						
	<u>Water</u>	N/A						
Notes / Comments								
•	f water under me	intuur oon?						
Approximately 20 milliliters o	ı water under mo	isture seal.						
			•					
<i>'</i>								
	TADLE							

TABLE 5

NO. TWR-17541 | VOL VII | SEC | PAGE 22

REV. ____

Field Joint Vent Valve and Moisture Seal - Evaluation Checkoff Worksheet (Optional)

		Valuation Checkon Work	
Inspector(s): CHARLES GREATWOOD/			10/5/00
Motor No.: STS-27	Side:	Left X Right	Date: 12/5/88
Field Joint: Forward (FWD)	Center (CTR)	Aft (AFT)	Case End: Tang
Component: JPS			
i. Vent Valves Open to Back Pressu	re (VVOBP)?		
A. <u>45°</u> Degrees		yes	X no
B. 135° Degrees		yes	_X no
II. Moisture Under Seal (WATER)?		yes	X no
(Optional)			
If any of the above conditions exist, n	ote:		
in any or the above conditions exist, h		_	
	Condition (Observation	Degree Location	
	Code)	(Deg.)	
	3323 ,	(509.)	
	 •		
Notes / Comments			
,			

000 20.	TWR-17541		VOL	VII
SEC		PAGE	23	

	Field Joint Externa	i Insulation Cor	idition - Eval	uation Checkoff W	orksheet	
Inspector(s):	CHARLES GREATWOOD,	ROY HYER/NED	RA HUNDLEY			
Motor No.: ST	S-27 .	Side	Left	Right	Date: 12	2/5/88
Field Joint:	X Forward (FWD)	Center	(CTR)	Aft (AFT)		
Component: J	PS					
A. Voids o B. Debond C. Charred	ork Insulation r Missing Material >0. s (DEBND)? Material (HTAFF)?))? 	yes	X no X no X no	
Condition (Observation Code)	Axial Location (Station) (In.)	Starting Degree Location (Deg.)	Ending Degree Location (Deg.)	Circumferential Width (In.)	Axial Length (In.)	Radial Depth (In.)
Notes / Comme Numerous nic paint in sev	ents cks on aft end of veral locations.	JPS cork insu Overall cork	ulation. S and K5NA i	light blisterin n excellent con	g of hypal	on

TABLE 7 REV. SEC

Field Joint External Insulation Condition - Evaluation Checkoff Worksheet						
Inspector(s):	CHARLES GREATWOOD	/ROY HYER/NED	ORA HUNDLEY			
Motor No.:	•	Side	: 🗶 Left	Right	Date: 12	2/5/88
Field Joint:	Forward (FWD) 🗵 Center	(CTR)	Aft (AFT)		·
Component: J	PS					· · · · · · · · · · · · · · · · · · ·
A. Voids of B. Debond C. Charred	ork Insulation r Missing Material >0. s (DEBND)? Material (HTAFF)?		D)?	· / = =	x no X no X no	
Condition (Observation Code)	Axial Location (Station) (In.)	Starting Degree Location (Deg.)	Ending Degree Location (Deg.)	Circumferential Width (In.)	Axial Length (In.)	Radial Depth (In.)
Notes / Comme Numerous ni blistering condition.	ents cks on aft end of of hypalon paint	JPS cork ins in several ar	ulation usi eas. Overa	ually .25 in ² or all cork and K5N	smaller, IA in excel	Slight

TABLE 8

DOC NO.	TWR-17541		VOL	VII
SEC		PAGE	25	

REV.

Field Joint External Insulation Condition - Evaluation Checkoff Worksheet						
Inspector(s):	CHARLES GREATWOOD,	ROY HYER/NED	RA HUNDLEY			
Motor No.:	STS-27	Side		Right	Date: 12	2/5/88
Field Joint:	Forward (FWD)	☐ Center	(CTR)	Aft (AFT)		
Component:	JPS	·				
A. Voids B. Debon C. Charre	Cork Insulation or Missing Material >0.7 ds (DEBND)? dd Material (HTAFF)?		·)?	yes	X no X no X no	·
Condition (Observation Code)	Axial Location (Station) (In.)	Starting Degree Location (Deg.)	Ending Degree Location (Deg.)	Circumferential Width (In.)	Axial Length (In.)	Radial Depth (In.)
Notes / Comm Cork and K several ar	5NA in excellent co	ndition. S1	ight bliste	ering of hypalor	n paint in	

NO.	TWR-17541		VCF	VIJ
SEC		PAGE	26	

	Field Joint Externa	I Insulation Con	idition - Eval	uation Checkoff We	orksneet	
Inspector(s):	CHARLES GREATWOOD,	/ROY HYER				
Motor No.: S	TS-27	Side	Left	X Right	Date:	12/5/88
Field Joint:	▼ Forward (FWD)	Center	(CTR)	Aft (AFT)		·
Component: J	PS					
A. Voids o B. Debond C. Charred	ork Insulation or Missing Material >0.3 or Missing Material >0.3 or Material (HTAFF)? Dove conditions exist,)?	yes	X no X no X no	
Condition (Observation Code)	Axial Location (Station) (In.)	Starting Degree Location (Deg.)	Ending Degree Location (Deg.)	Circumferential Width (In.)	Axial Length (In.)	Radiai Depth (In.)
Slight blis	ents icks on aft end of stering of hypalon excellent condition	paint in sev	ulation us eral locat	ions. Overall d	r smaller cork and	

REV.	OCC NO.	TWR-17541	VCL	VII
	SEC		PAGE	
			27	

			aition - Evail	uation Checkoff We	orksneet	
Inspector(s):	CHARLES GREATWOOD/	ROY HYER				
Motor No.:	STS-27 ·	Side:	Left	🔀 Right	Date: 12	/5/88
Field Joint:	Forward (FWD)	Center (CTR)	Aft (AFT)		
Component:	JPS					
A. Voids of B. Debond C. Charred	ork Insulation or Missing Material >0.7 is (DEBND)? d Material (HTAFF)? bove conditions exist,)? <u>x</u>	yes	no < no < no	
Condition (Observation Code)	Axial Location (Station) (In.)	Starting Degree Location (Deg.)	Ending Degree Location (Deg.)	Circumferential Width (In.)	Axial Length (In.)	Radiai Depth (In.)
adhesive ov Numerous ni	ents approximately 3.0 ver mosture seal ap icks on aft end of istering of hypalon	proximately . JPS cork insu	.150 inch i Llation usu	in area around m wally .25 in ² or	nissing cor	and k.

TABLE 11

000 70 .	TWR-17541		VCL	VII
SEC		PAGE	28	

REV.

Field Joint External Insulation Condition - Evaluation Checkoff Worksheet

	Field Joint Externa	insulation Cor	Idition - Evan	uation Checkoff W	O KSTIGGE	
Inspector(s):	CHARLES GREATWOOD	/ROY HYER				····
Motor No.:	STS-27 ·	Side	Left	X Right	Date: 12/	/5/88
Field Joint:	Forward (FWD)	Center	(CTR)	Aft (AFT)		
Component: J	IPS	·				
A. Voids o B. Debond C. Charred	ork insulation or Missing Material >0. is (DEBND)? if Material (HTAFF)? pove conditions exist,)? 	yes	x no x no x no	
Condition (Observation Code)	Axial Location (Station) (In.)	Starting Degree Location (Deg.)	Ending Degree Location (Deg.)	Circumferential Width (In.)	Axial Length (In.)	Radial Depth (In.)
Notes / Comme Cork and K5 several loc	NA in excellent co	endition. S1	ight bliste	ering of hypalon	n paint in	

TABLE 12

REV.	DCC NO.	TWR-17541	VOL VI
	SEC	PAC)E

29

Field Joint Heater Cable Condition - Evaluation Checkoff Worksheet

Incorporation (a)	CHADLEC COREATIV	000 (DOV 11VED			·		
Inspector(s): Motor No.: STS	CHARLES GREATWO		Side: 🛛 Left (A) 🔲 Rigi	+ (B)	Date: 12/	F /00
Inspection Locat		to Lifting Stra	*****	~/ <u>~</u>			ସ/ ୦୦ ean Removal
Component: TPS		to Litting One					
I. External Cor					<u>-</u>		
	Missing Material (TPSVD)?		yes	X	_ no	
B. Debonds		•		yes	X	_ no	
C. Charred	•	•		yes	_X_	_ no	
	amage (TPSDM)?			yes	<u> </u>	_	•
II. Cables Debo	onded (DEBND)?			yes	_X	_ no	
If any of the abo	ve conditions exis	t, note:					
		Axial	Starting	Ending			
Segment	Condition	Location	Degree	Degree		mferential Vidth	Axial
(FWD, FCS, ACS or AFT)	(Observation Code)	(Station) (In.)	Location (Deg.)	Location (Deg.)		(in.)	Length (in.)
		\····/	(33,1)				
	-					·	
Notes / Commer	nts						
JPS cable co	ork and K5NA in	excellent co	ondition. S1	ight bliste	ring o	f hypalon	
paint in sev	veral locations				Ū		
							

TABLE 13

DOC TWR-17541 VOL

SEC PAGE 30

Field Joint Heater Cable Condition - Evaluation Checkoff Worksheet

Inspector(s): CHARLES GREATWOOD/ROY	HYER	
Motor No.: STS-27	Side: Left (A) X Right (B	Date: 12/5/88
Inspection Location:	Strap Installation	X After Ocean Removal
Component: TPS		
 External Cork Insulation A. Voids or Missing Material (TPSVD)? B. Debonds (DEBND)? C. Charred (HTAFF)? D. Impact Damage (TPSDM)? Cables Debonded (DEBND)? 	yes	
If any of the above conditions exist, note:		
Axial Segment Condition Location (FWD, FCS, (Observation (Station) ACS or AFT) Code) (In.)		rcumferential Axial Width Length (In.) (In.)
Notes / Comments All JPS cable TPS in excellent conditions.	ition, cork and K5NA. Looks 1	ike it hasn't

TABLE 14

DOC
NO
TWR-17541

VOL
SEC
PAGE
01

Igniter Heater Installation Condition - Evaluation Checkoff Worksheet

inspector(s): CHARLES	S GREATWOOD/BILL	McPFAK/.]IM	I McEVEN		
Motor No.: STS-27	J GILLIANOUS BILL	Side:		Right (B) Date:	12/5/88
Joint: Igniter (IGN) Case End	gniter Ada	pter (FWD)	Compo	onent: JPS
I. Igniter (IGN I. Igniter Heater A. Unsecure(LOOS B. Improper positi II. Cork Insulation A. Unsecure(LOOS B. Improper positi III. T-Bolt Latch Band A. Unsecure(LOOS B. Improper positi IV. Igniter Heater Pow A. Unsecure(LOOS B. Improper positi	SE)? on (DISCP)? SE)? on (DISCP)? I Clamp SE)? on (DISCP)? ver Cables SE)?	Igniter Ada	yes	X no X	onent: JPS
If any of the above co	•	Starting Degree Location (Deg.)	Ending Degree Location (Deg.)	Circumferential Width (In.)	Axial Length (In.)
Notes / Comments Igniter heater ins	stallation is sec	ure and ir	n proper positio	on.	

TABLE 15

NO. TWR-17541 VOL VII

REV.

Igniter Heater Installation Condition - Evaluation Checkoff Worksheet

nspector(s): CHARI	ES GREATWOOD/BIL	L McPEAK/JIM Mc	EVEN		
Motor No.: STS-2	27	Side: 0	Left (A)	Right (B)	Date: 12/5/88
Joint: Igniter (GN) Case	End: Igniter Adapte	or (FWD)		Component: JPS
l. Igniter Heater					
A. Unsecure(Li	DOSE)?		yes	X	_ no
B. Improper po	sition (DISCP)?		yes	X	_ no
 Cork Insulation 					
A. Unsecure(Li	,		yes	<u> </u>	
•	sition (DISCP)?		yes	_X	_ no
II. T-Boit Latch B	•			v	
A. Unsecure(LC		•	yes	_X	_ no
	sition (DISCP)?		yes	<u>_X</u> _	_ no
V. Igniter Heater i			400	v	no
A. Unsecure(L			yes	_X	-
p. Improper po	sition (DISCP)?		yes	<u>X</u>	_ 110
Affected Part (I, II, III or IV)	Condition (Observation Code)	Degree Location (Deg.)	Degree Location (Deg.)	Circumferd Width (In.)	
Notes / Comments					
Igniter heater	installation is	secure and in p	roper positio	on.	

REV	. O	NO. TWR-17541			VOL VII	
<u></u>	S	C		PAGE	33	

ıç	niter Heater Component	- Evaluation Checkoff W	Orksiteet
Inspector(s): CHARLES GR	EATWOOD/BILL McPEAK/		
Motor No.: STS-27	Side		pht Date: 12/5/88
Joint: Igniter (IGN)	Case End: Igniter	Adapter (FWD)	Component: JPS
 I. T-Boit Latch Band Claim II. Igniter Heater A. Delaminations (DLH B. Discolorations (DSC C. Charred (HTAFF)? D. Warped (HTAFF)? III. Heater Power Cables A. Not Intact (LOOSE) B. Charred (HTAFF)? 	LR)?	yesyesyesyesyesyes	
If any of the above condition	ons exist, note:		
Affected Condit Part (Observ (I, II or III) Code	ation (Station)	Starting Ending Degree Degree Location Location (Deg.) (Deg.	e Circumferential Axial on Width Length
Notes / Comments Heater charred and war and extending for 7.5		ches from heater wire	e lead egress end

REV	NO. TWR-17541	VOL VI]
	SEC	PAGE 34	

REV.

Igniter Heater Component - Evaluation Checkoff Worksheet

Motor No.:		Side	: 🛛 Left	Right	Date: 12/5	/88
Joint: Igni	ter (IGN) Ca	se End: Igniter	Adapter (FWD))	Component	: JPS
. T-Bolt Lat	ch Band Clamp Asser	nbly Intact (BAN	(D)?	yes	_X no	
	nations (DLHTR)?			yes	X no	
	rations (DSCLR)?		<u> </u>	•	no	
	i (HTAFF)? i (HTAFF)?		<u>^</u>	yes yes	no no	
II. Heater Po	•			763		
	act (LOOSE)?			yes	X no	•
	(HTAFF)?			yes	no	
fany of the al	bove conditions exist,	note:				
		Axial	Starting	Ending		
Affected	Condition	Location	Degree	Degree	Circumferential	Axial
Part	(Observation	(Station)	Location	Location	Width	Length
(I, II or III)	Code)	(ln.)	(Deg.)	(Deg.)	(In.)	(ln.)
						
						
	•					
lotes / Commo		2				
neater than	rred and warped in	5 praces.				
77						
+++,						
	The second second second is a second	a primario nettratta tra se i data e e aliga yamang e ya e sanza ya pinario sa ana ya ana ya ana ya ana ya ana	رد ودود الوديد (بالمادينية و منسود بالمادية المادية و الدادية المادية المادية المادية المادية المادية المادية	The second secon	en for the Copy and the Copy of the Copy o	
4				1		9.
25*						k 3
			15	4	—33 <i>5</i> ——	
- 3 /1				-		
- 3 /1						•

SEC

MORTON THIOKOL, INC.	

Space Operations

DISTRIBUTION

		MS
E.	HALE	L23B
J.	OOSTYEN	L23B
R.	WILKS	L23
J.	SEILER	L10
R.	LARSEN	851
т.	OLSEN	L31
R.	ADARES	851
T.	MORGAN	L10
s.	OLSON	L35
c.	WHITWORTH	L40

DOC NO. TWR-17541 VOL VII PAGE 36